Special Report
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Carnegie Mellon University
Software Engineering Institute

Directory of Industry and University Collaborations with a Focus on Software Engineering Education

Kathy Beckman, Computer Data Systems, Inc.

Version 5

October 1996

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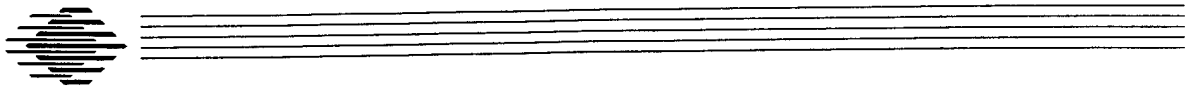

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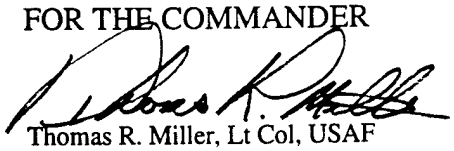

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SEI Joint Program Office

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Directory of Industry and University Collaborations with a Focus on Software Engineering Education

Abstract: This directory describes collaborative efforts to promote software engineering education among businesses and universities in the United States and Canada. The groups vary in their maturity and the services they provide. The reader can use this directory to find collaborations that match their needs and are located within their geographic area.

Introduction

This directory contains information on collaborative efforts to promote software engineering education, usually within a specific geographic area. It allows the reader to locate an existing group with which to interact as a potential member, supporting university, or commercial provider of educational services. The directory provides brief descriptions of currently identified collaborations. It is expected that the directory will grow as more such collaborations are formed and identified.

The groups described vary in their maturity and in the type of services they provide. Some groups merely share information and experience; others offer software engineering classes to members and non-members for a fee. Obtaining cost-effective education designed to specification and delivered locally is often difficult for a single organization, but when organizations pool resources and share classroom seats, costs go down. A nearby university typically serves as the group facilitator and coordinates class offerings. These offerings may be selected by a refereed process from course proposals solicited from educational vendors.

For a software organization, the directory provides an awareness of geographically convenient collaborations. If none are available locally, the descriptions of existing collaborations may serve as a model for the formation of a local group. The more mature groups are serving as models to emerging groups, providing examples of organization structure, charters, fee arrangements, and other pertinent information.

For colleges and universities, the directory highlights a potential business opportunity and a way to become more involved in the local industrial community. The points of contact from universities are experts in techniques for organizing local efforts.

For educational providers, the directory can serve as a pointer to new potential client bases.

A short bibliography is provided to point the reader to background material on software engineering curricula, coalitions in other countries, software process improvement networks

(SPINs), and the Capability Maturity Model[SM] (CMM[SM]), developed by the Software Engineering Institute (SEI), and its key process areas (KPAs). These topics are relevant to the discussion of the goals of the collaborations.

1. [SM] The Capability Maturity Model and CMM are service marks of Carnegie Mellon University.

Geographical Data

The following lists indicate by U. S. state or Canadian province where the university and industry collaborations described in this directory are located.

British Columbia

Software Productivity Centre (page 32)

The University of British Columbia Certificate in Software Engineering (page 39)

California

California State University, Long Beach Software Engineering Forum for Training (page 12)

Software Industry Coalition (page 30)

University of California, Santa Cruz (page 42)

The University of Southern California Center for Software Engineering (page 47)

District of Columbia

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D.C. SPIN Training Group (page 20)

Florida

Embry-Riddle Aeronautical University Software Center (page 21)

Florida Atlantic University (page 23)

University of South Florida (page 49)

Maryland

University of Maryland University College (page 44)

Nebraska

Applied Information Management (AIM) Institute (page 9)

New York

Computer Applications and Software Engineering (CASE) Center at Syracuse University (page 14)

Ontario

Consortium for Graduate Education in Software Engineering (ConGESE) (page 16)

Consortium for Software Engineering Research (CSER) (page 18)

Quebec

Quebec Master's Program in Software Engineering (page 26)

Saskatchewan

Software Technology Centre (page 36)

Texas

Alliance for Higher Education (page 5)

Research Institute for Computing and Information System (RICIS) (page 28)

Software Quality Institute (page 34)

The University of Texas at Austin (page 51)

Alliance for Higher Education

The Alliance for Higher Education creates partnerships between academic and corporate communities to respond to the educational demands of business, industry, and government and to facilitate cooperative activities. It began its mission in 1967 with The Association for Graduate Education and Research (TAGER) television network, which brings higher education to the workplace. The Dallas chapter of the software process improvement network (SPIN), in conjunction with the Association for Software Engineering Excellence (ASEE), is working to provide software engineering education over the TAGER network.

Organization

The Alliance for Higher Education is a not-for-profit, non-government agency. It is directed by a board of trustees. Presidents and chancellors of member academic institutions provide direction through the Council of Presidents.

Membership

There are three categories of membership:

1. Principal participants are colleges and universities, currently numbering about 25.
2. Associate participants are institutions, agencies, or companies that are substantial users of Alliance services.
3. Service subscribers participate in Alliance services.

All membership categories have a membership approval process. There is a fee structure for membership.

Course Acquisition

Influenced by both the Dallas SPIN and SEI curriculum guidelines, Southern Methodist University, Texas Christian University, and The University of Texas at Arlington offer graduate courses in software engineering over the TAGER network. The Alliance produces a course catalog.

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American University

American University (AU) in Washington, D.C., in cooperation with the Center for Systems Management (CSM) in Cupertino, Calif., offers a Graduate Certificate Program in Systems and Project Management (SPM). The SPM Certificate Program addresses current and emerging project and management issues related to the orderly and controlled analysis, design, development, implementation, operation, maintenance, and replacement of systems of all types. The program focuses on organizational functions and processes usually thought of as management: planning, organizing, controlling, training, budgeting, and business administration. It also deals with functions that are traditionally considered as technological: process improvement, system economics, human factors, telecommunications, systems analysis and design, and legal and ethical issues. The concepts of process maturity and continuous process improvement have been infused into the entire curriculum.

The certificate curriculum is centered around four CSM-developed courses designed for software development and maintenance project managers and team members and includes a selection of courses from the Department of Computer Science and Information Systems (CSIS) and the Kogod School of Business at AU. The program provides 15 graduate level credits and a Certificate of Systems and Project Management for students who successfully complete the program. This includes three required and two elective courses of three credit hours each. All of the courses are taught by full-time or adjunct faculty of AU. Non-credit offerings with a certificate of completion are also available. In addition to the SPM Certificate, AU offers graduate certificates in information systems, computer science, and information resource management.

Organization

This cooperative venture is governed by a joint memorandum of understanding that defines the roles and relationships of the parties involved: the College of Arts and Sciences, Department of Computer Science and Information Systems and the Kogod School of Business, and the CSM. Under this agreement, all course offerings are arranged through AU with the CSM providing their courses under contract. All instructors are full-time or part-time university faculty. The program is managed by the CSIS.

Membership

American University is an independent, coeducational university with more than 11,000 students enrolled in undergraduate, master's, doctoral, and professional degree programs. AU provides many different types of adult and continuing education programs designed for the working professional. The CSM, located in Cupertino, California, is a training and mentoring organization of experienced project managers. CSM provides courses in project management, systems engineering, software process improvement, project business

management, and integrated product teams to government agencies and project-dependent companies.

Participants in the Graduate Certificate program are typically funded by their organizations. Organizations that have participated in the program include Lucent Corporation sites in New Jersey, Georgia, and Missouri, and the Defense Intelligence Agency in Washington, D.C. Participation with AT&T in Virginia and with a training consortium of high-tech companies in Northern Virginia is currently being negotiated.

Course Acquisition

The program is offered at client sites and on-campus to individuals and to groups from corporations, government agencies, and other organizations. Courses are typically presented in a compressed format (i.e., five full-days of instruction for a three-credit course, all in one week or over three weekends). Admission to this program is limited to students who can present evidence of experience that demonstrates a foundation of basic knowledge of systems and project principles and practices. The experience may include course work or work experience obtained within the past seven-year period prior to admission to the program

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Applied Information Management (AIM) Institute

The AIM Institute is a membership organization promoting business growth related to information technology. The mission of the AIM Institute is to provide information technology leadership to the greater Nebraska community by focusing and coordinating the resources of its educational, governmental, and private business partners.

Organization

It is increasingly evident that the economic health of a firm, industry, state, region, or even an entire economy is dependent upon information technology strategies. In the coming era, networking and other information technologies that connect individuals and firms into local, regional, national, and international markets will be essential to sound economic growth and development.

Equally important is the development of an intellectual infrastructure to prepare the knowledge workers of tomorrow. More important than additional fiber optics is an understanding of access techniques and available opportunities.

The Omaha community, seeking insight into how to maintain and strengthen the city and state business environment, commissioned several studies during the 1989-1991 period. All of these studies documented the need to bring focus to the area's information infrastructure.

The Omaha business community, with the full cooperation of the educational and government sectors, decided to create an institute to help make Omaha "one of a handful of preeminent national information centers." Thus the AIM Institute was created to improve Omaha's already enviable position as a world communication leader.

The vision, agenda, and direction for each of the primary activities of AIM are developed and refined through continual interaction with business, technology, and academic leaders. Among the services provided by AIM are continuing education opportunities, support for academic curriculum development, employment services, facilitation of cooperative industry-university applied research, and assistance with new business development.

Membership

The AIM membership categories are corporate, educational, and other. For a list of current members, see the members Web page.

URL: http://www.omaha.org/members.htm

The entire community profits as AIM members achieve common objectives. Corporate contribution is evolving into a benefit-based membership, providing direct value or service to

the member, while strengthening the Nebraska information technology environment. Specific benefits to AIM members are:

- Discounts on continuing education.
- Access to relevant college accredited courses.
- Reduced out-of-state travel.
- Increased staff preparedness, improved staff retention.
- Student and faculty internship placement.
- Employee recruitment assistance.
- Participation in setting AIM direction.
- Post-secondary education support.

Six levels of corporate membership are available, ranging from $1,000 to $75,000 annually. New members are always welcome. Funding is provided through annual memberships, grants, and fees from seminars. Opportunities for state, federal, and private funding are continuously explored.

Course Acquisition

AIM supports education in information technology through

- continuing education. This consists of seminars and training courses discussing telecommunications, computer issues, business processes, and other topics. These programs maintain and improve the skill level of the workforce.
- curriculum development. This supports colleges in the development of curricula addressing emerging communication and information technology issues to better prepare students for the workplace. Through forums for business and academia to exchange ideas, educators develop a greater understanding of business needs and firms gain insight from faculty.

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California State University, Long Beach Software Engineering Forum for Training

Formed in September 1993, the California State University, Long Beach (CSULB) Software Engineering Forum for Training (SEFT) is a training partnership among companies in the Long Beach, Los Angeles, and Orange County areas. CSULB SEFT provides high-quality, cost-effective, tailored training in software engineering process improvement and management practices to employees of member companies. Membership in the consortium provides the opportunity to influence and guide the training curriculum.

Organization

SEFT has an advisory executive board and a technical committee composed of member and CSULB representatives. The Executive Board is the policy-making body, and the Technical Committee develops curricula and assists the board. SEFT is administered by University College and Extension Services and has a charter and documented operating plan.

Membership

Members of SEFT include McDonnell Douglas, Northrop Grumman Corporation and TRW. Funding of SEFT is provided through the sale of annual memberships. Membership fees are applied directly to the training that companies receive. Members have seats of the Executive Board and the Technical Committee, priority access to training at a reduced cost, and direct input into the selection of course topics and curriculum.

Course Acquisition

Following a thorough needs assessment, course topics and objectives are identified, and detailed course outlines are written. Potential instructors and faculty are solicited to begin customization of courses. SEFT works with an in-house training consultant and faculty of the Computer Engineering and Computer Science Departments on campus to design and develop curriculum.

Courses cover subject areas related to software process improvement, for example, software configuration management, software metrics, software reuse, software testing, software risk management, and ISO 9000. Courses are open to the public. University College and Extension Services has extensive mechanisms, such as videoconferencing, for delivering distance education.

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Computer Applications and Software Engineering (CASE) Center at Syracuse University

The CASE Center at Syracuse University is one of New York State's original Centers for Advanced Technology (CATs). Initiated in 1983, the CAT program represents a creative partnership among universities, industry, and government designed to accelerate the development of commercially relevant technologies. Key goals are increased industrial productivity, a strengthened technological infrastructure, and more effective technology transfer —all helping to spur economic growth.

Organization

The CASE Center is managed by its director, Robert R. Birge, and its managing director, Eugene Woodcock. Faculty researchers, university administrators, and CASE staff assist the directors with industrial liaisons, technology transfer, and outreach programs. More than 60 faculty members from a dozen academic departments and campus organizations are affiliated with the center. The CASE Center's research program emphasizes four major technical areas: software engineering research, computer-aided design, distributed information systems (emphasizing multimedia), and scientific modeling. Each area involves development and enhancement of computer software. The Software Engineering Program focuses specifically on developing tools and methods for improving the quality of software through such techniques as software metrics and formal methods, object-oriented methods, neural networks, associative processing, and parallel software. The center operates several specialized laboratories, including the Software Engineering Lab, Open Systems Cluster, and ATM Distributed Computing Lab, that support research, technology transfer, and advanced training activities. Research results are disseminated through conferences, workshops, seminars, demonstrations, and special events. Publications include technical reports, a newsletter, and informational materials.

Membership

In addition to federal grants and seed funding from the New York State Science and Technology Foundation, the CASE Center has received funding from over 120 companies, universities, and government organizations, the majority of them operating within New York. The center conducts joint research with industry and other outside sponsors. Through the Industrial Membership Program, partners receive invitations to workshops and conferences, special assistance, and representation on an advisory board. The center also provides technical consulting, access to computer facilities and special information systems, laboratory interactions, and specific technical services.

Course Acquisition

The CASE Center offers a variety of educational opportunities for both college students and corporate personnel. Dozens of qualified graduate students are supported on research assistantships every year and company employees enrolled in graduate degree programs frequently participate in collaborative research with CASE faculty. To introduce the most recent scientific advances to the commercial sector, the center regularly sponsors short courses, tutorials, and other technical sessions targeted to business and industry. Laboratories provide hands-on training and practical applications of theoretical concepts.

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Consortium for Graduate Education in Software Engineering (ConGESE)

ConGESE provides education specially structured for software professionals in Ontario industries, leading to a master's degree in computer science, with an emphasis in software engineering. Each of six participating universities offers courses in this program. The courses are typically offered on-site with cooperating industrial sponsors and are designed for the working professional, who might otherwise find it difficult to attend regular, on-campus graduate programs. ConGESE is responsible for maintaining the curriculum and administering the program and course delivery. Degree granting rights rest with the participating universities.

Organization

ConGESE is governed by a committee structure composed of the Executive Board, Academic Steering Committee, and Industry Steering Committee. Curriculum issues are handled by the Curriculum Committee. Additionally there is a Technology and Continuing Education Committee and a Promotion and Funding Committee. Committee responsibilities are shared across the participating universities and companies.

Membership

The universities participating in ConGESE are all those that grant PhD degrees in computer science in Ontario.

- Carleton University
- Queen's University
- University of Ottawa
- University of Toronto
- University of Western Ontario
- University of Waterloo

Industrial participation started with substantial support from the IBM Toronto Laboratory and Bell Northern Research Ltd. The ConGESE program is financially supported by the Information Technology Research Centre, an Ontario Centre of Excellence.

Course Acquisition

Four areas make up the technical core of software engineering courses.

1. requirements and specification
2. architecture and design
3. reuse and maintenance
4. verification and testing

Other areas round out the coverage of software engineering.

- application classes and support software technology
- management of people, products, projects, and processes

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Consortium for Software Engineering Research (CSER)

Formed in March 1996, the Consortium for Software Engineering Research (CSER) is a not-for-profit partnership between Canadian industry and university members together with the National Research Council, Canada. The industry-directed research program seeks to improve and expand the methodologies, tools, and techniques used to construct, deploy support, and evolve software and to improve the quality of software, increase productivity, and manage the costs. A crucial and immediately realizable benefit is a greater appreciation among the university community of key software engineering problems experienced by industry and the context relevant to evaluating proposed solutions. This includes industrial strength tools, mega-line proprietary code bases, field feedback data, and constraints such as best solution by fixed date instead of best solution possible. This hopefully will lead to more relevant and timely educational programs in Software Engineering at Canadian universities.

Organization

CSER is governed by the board of directors, which is composed of industry and academic representatives, with industry as the voting majority. The research work is grouped into themes, which are each led by a theme steering committee composed of researchers from industry, government, and academia. The initial research theme is "Empirical Evolution of Legacy Code to Modern Architectures." The membership is expected to expand to three themes by 1998. The interaction between theme projects and the promulgation of the research results will be stimulated by the creation of a Demonstration Center at The Institute for Information Technology of the National Research Council.

Membership

Current members of CSER include Centre for Advanced Studies IBM Canada (Toronto), Nortel Technology (Ottawa), Object Technology Inc. (Ottawa), Mitel Corporation (Ottawa), and Bell Canada (Montreal) working together with the researchers from University of Toronto University of Victoria, University of Waterloo, Acadia University, University of Montreal, and University of Ottawa. The research is funded by direct contribution of industry partners and grants from The Natural Sciences and Engineering Research Council (NSERC), Canada's largest research granting council.

Course Acquisition

CSER does not offer courses. However, demonstrable evidence of impact on educational activities in software engineering in the universities, e.g., case studies and influence on course material, is a condition of the funding.

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D.C. SPIN Training Group

The Washington, D.C., Software Process Improvement Network (SPIN) started a training group in early 1993. This special interest group meets monthly, usually the third Thursday night of the month, from September through June. Networking begins at 6:30 p.m. with a light dinner, followed by a speaker and information sharing from 7:00-8:00 p.m.

Organization

The D.C. SPIN Training Group has drafted a charter that includes both training and education goals. At the moment, the organization is run by a loose association of volunteers. Meetings usually feature speakers who share information about their organizations' training programs, recap pertinent presentations from national conferences, or describe available training. Traditionally, the SEI provides a speaker for the September D.C. SPIN meeting to kick off the year's activities.

Membership

Members are drawn from the D.C. SPIN. There are approximately 90 members. There is no membership fee. Attendance at meetings ranges from 10 to 15 people. Individuals may request that they be added to the training group mailing list to receive announcements and minutes of meetings.

Course Acquisition

To date, the D.C. SPIN Training Group has not acquired any classes for its members. It did, however, send students to a pilot offering of an SEI course.

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Embry-Riddle Aeronautical University Software Center

The Embry-Riddle Aeronautical University (ERAU) Software Center is an umbrella organization encompassing software engineering education and research activities. The Center serves as a research and learning laboratory, combining applied research in software engineering and advanced practices in software engineering education. The objectives of the center are:

- To provide an experiential learning environment for software engineering students that prepares them for the industrial needs of their future employers.
- To conduct research that contributes to the advancement of software engineering practices.

Organization

The center is an arm of the ERAU Computer Science Department. An industry advisory board provides guidance to the department with regard to curriculum and research activities.

Membership

The center works in collaboration with the Software Engineering Institute (SEI) for its "Doing Quality Work" initiative and with Motorola Paging Group to establish the practice of the Personal Software Process (PSP). Both efforts promote the PSP, which is aimed at helping software engineers perform their work better by following a defined individual process.

Course Acquisition

The application domain of software engineering education at ERAU is aviation and aerospace. The department offers two degree programs: a bachelor's degree in computer science with a strong emphasis on software engineering and a master's degree in software engineering. The Master of Software Engineering program includes a choice of one of two areas of specialization: real-time systems and software process. The PSP course is required in both areas of specialization. It teaches a new and more disciplined way to practice software engineering at an individual level.

During the 1995-96 academic year, the Computer Science Department experimented with a new approach to teaching its first two courses in the undergraduate curriculum. Called "Doing Quality Work," the new approach is a joint effort between the computer science faculty and Watts Humphrey of the SEI. Practices of top software development organizations are integrated into the software engineering students' earliest courses. In Computer Science I, ten

15- to 20-minute lectures on time management, scheduling, and planning are introduced. The students are required to keep a software engineer's notebook containing time logs and scheduling and planning documents. In the following term, 10 additional short sessions are introduced in Computer Science II. The additional sessions of both courses focus on software defect management.

A collaborative project is underway between the Motorola Paging Group and ERAU to insert PSP practices into the Motorola Paging Group's software development process. The elements of the cooperative effort are training, tracking, coaching, and community building. The purpose of the work is to demonstrate quantitatively the benefits of practicing the PSP in an industrial setting.

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Florida Atlantic University

The Florida Atlantic University (FAU) Computer Science and Engineering (CS&E) Department and members of its Industry Advisory Committee recognized a need to establish an extensive graduate education effort in software engineering. Through a combination of video presentations produced by the Software Engineering Institute (SEI) and FAU-produced live lectures, a series of six graduate-level software engineering courses was offered consecutively at six university and industry sites in southeast Florida during 1990 and 1991, and in a limited fashion until April 1993. The courses were fully funded by the participating industries. On January 16, 1992, 59 students were awarded certificates in software engineering for successfully completing at least 5 of the 6 courses. By the spring term of 1993, over 250 students had taken at least one course. The article "Current Practices, Culture Changes, and Software Engineering Education" provides details on this extended program [Coulter 94]. Since this successful program, FAU has expanded its internal offerings through the statewide Florida Engineering Educational Delivery System (FEEDS). Through FEEDS, courses are offered remotely by videotape and live broadcast, and locally in standard lecture format, to subscribing sites and on-campus students. Beginning in 1995, the FAU CS&E Department approved and implemented a software engineering option within its existing master's programs. Many of the courses are offered through FEEDS.

Organization

The FAU CS&E Department formed the Industry Advisory Committee to help the department identify and meet the needs of the large computing-based industry in southeast Florida. During the advisory committee's initial meetings, the need for extensive graduate software engineering courses for employees quickly emerged as the top issue. While FAU offered software engineering courses as part of its graduate programs, it was not prepared to offer the variety and number of courses that were needed immediately without more financial assistance and faculty. FAU contracted with the SEI to obtain a set of video-based courses to be delivered by FAU faculty.

Membership

Nine research and development firms having headquarters or major plants in southeast Florida were invited to join the FAU CS&E Department Industry Advisory Committee: Bendix King, Encore Computer Corporation, Harris, IBM, Modular Computer Systems, Motorola, Siemens Stronberg-Carlson, Racal-Milgo, and United Technologies. These companies fully funded the courses taught between 1990 and 1993 in the graduate software engineering education program.

Course Acquisition

The courses taught between 1990 and 1993 in association with the SEI were Software Project Management, Software Verification and Validation, Software Design, Software Creation and Maintenance, Software Specification, and Software Systems. During the 1996-97 academic year, FAU offered the courses Software Engineering, Object-Oriented Software Design, Formal Specification Methods, Software Engineering Measurements, Real Time Software, Systematic Software Reuse, and Software Process Improvement to employees of companies including Harris, IBM, Motorola, Racal-Datacom, Siemens, Pratt and Whitney, Encore, Allied Signal, and Sensormatic. FAU now offers a software engineering graduate specialty track in the MCS and MSCS programs. Students must take at least two courses from each of the groups shown below, as well as additional course and thesis work.

Group 1: Fundamentals

- Object-Oriented Software Design
- Formal Aspects of Computer Science and Engineering
- Software Testing
- Software Requirements Engineering

Group 2: Development

- User Interface Design
- Computer-Aided Software Engineering
- Formal Methods
- Advanced Topics in Object-Oriented Design

Group 3: Quantitative and Experimental

- Software Engineering Measurements
- Software Reliability Engineering
- Model-Based Simulation
- Computer Performance Modeling

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Quebec Master's Program in Software Engineering

The Quebec software engineering program was designed based on the needs expressed by leading software industries in Quebec. This program leads to a master's degree in computer engineering or computer science, with emphasis in software engineering. Each of seven participating schools or universities offers courses in this program.

Organization

Each educational partner designates a professor specialized in software engineering to coordinate the program at his school. This professor represents his school on a coordination committee that determines the courses to be offered in the program, student admission requirements, and the criteria for granting degrees. The coordination committee establishes the membership of a business and industry committee that advises on the applicability of the program to their working environments and guides the evolution of the program.

Membership

The educational partners participating in the master's program in software engineering in Quebec are

- L'Ecole Polytechnique de Montreal
- L'Ecole de Technologie Superieure
- L'Institut National de Recherche Scientifique
- L'Universite Concordia
- L'Universite Sherbrooke
- L'Universite du Quebec a Montreal
- L'Universite Laval

Course Acquisition

To complete the program, the student must earn 45 credit units, equally distributed over

- A foundations module.
- An area of specialization.
- An integrated learning experience composed of courses, an optional case study, and a project requiring at least 27 hours per week.

The courses focus on topics such as data representation, expert systems and artificial intelligence, system security, parallel systems, and object-oriented approaches.

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Research Institute for Computing and Information Systems (RICIS)

The mission of RICIS is to provide a setting for interdisciplinary research coalitions to explore computing technology and corresponding implications for an information-driven civilization. RICIS provides the research evaluation and advocacy needed to build coalitions and partnerships to match new and promising technologies with challenging problems dealing with complex, computing-based systems for the benefit of the university, NASA, and the general public.

Emphasized research areas include software reuse, group decision support methodology, mission- and safety-critical systems, and medical imaging. New projects are being formed in digital libraries, environmental computing, and network information resources. Special emphasis is placed on design and execution of symposia, projects, and interchanges to facilitate technology transfer among RICIS participants.

Organization

The University of Houston at Clear Lake (UHCL) established RICIS in 1986 to encourage the NASA Johnson Space Center (JSC) and local industry to actively support research in computing and information systems. A cooperative agreement between UHCL and NASA/JSC provides for sharing of personnel and computing and educational facilities. The RICIS Program Office in the School of Natural and Applied Sciences manages funding from various sources, primarily from NASA under the cooperative agreement. The overall organization is that of collaborative projects within the broad research areas mentioned.

Membership

RICIS encourages faculty participation across UHCL schools: Natural and Applied Sciences, Business and Public Administration, Human Sciences and Humanities, and Education. A gateway concept expands the local expertise on targeted problems to include vendors, other universities, and other research organizations. Fees are charged only for direct participation in projects.

Course Acquisition

Courses and special events are organized in conjunction with the UHCL Professional and Continuing Education unit. A Master of Software Engineering degree program and a Master of Computer Engineering degree program are offered. An undergraduate degree in computer systems engineering, a blend of software engineering and computer engineering, is scheduled for approval by the Texas Higher Education Coordinating Board at its October 1996 meeting. This will provide students the opportunity to take a single track at the undergraduate level leading to a Master of Software Engineering or a Master of Computer Engineering.

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Software Industry Coalition

Established in the spring of 1993, the Software Industry Coalition is a non-profit, mutual benefit corporation dedicated to improving the effectiveness of the software industry's relationships, workforce, processes, and products. The mission of the Software Industry Coalition is to identify significant software industry issues, act as a catalyst in resolving those issues, and present a coordinated industry voice.

Organization

The Software Industry Coalition is led by its board of directors, which is composed of member representatives. It is managed by a small executive staff. Coalition members and staff have identified projects and working groups that are of interest, for example:

- The Software Skills Upgrade Project (SSkillsUP) is designed to create a software-competent workforce that is supported and trained through extensive partnerships among industry, educational organizations, and government.
- The Software Process Group shares best practices in software development process.
- The Information Systems Group shares best practices in information systems management.
- The coalition has researched and published the Software Creator's Profiler as a tool for managers, human resources professionals, and software professionals to assess the skills and training requirements for any software creator's job. This is an ongoing project examining the underlying skills required of software creators.
- The coalition co-sponsored a labor market study of employment practices for software creators. The study shows the systemic relationships among employers, educators, and career facilitators.
- The Intellectual Property Committee provides forums to educate members on the consequences of legislative activity and assist in developing a consensus on the issues.

Membership

Members reflect the diversity of the software industry: independent software vendors, government laboratories, universities and colleges, and computer manufacturers. Membership fees support the work of the projects.

Course Acquisition

In collaboration with universities, consultants, and corporate education teams, the Software Industry Coalition develops focused, timely, and effective technical education and training programs that ensure implementation of sound product development and management processes. Success is measured in part by the development and delivery of multiple workshops, courses, and curricula to meet the identified needs of the industry on an ongoing basis.

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Software Productivity Centre

The Software Productivity Centre (SPC), located in Vancouver, British Columbia, is a technical resource centre for software developers. Collaborating with software organizations around the world, the Centre focuses on finding solutions to the problems and challenges faced by software development companies. The SPC provides training, technical services, consulting, and products to meet the needs of the industry.

Organization

Since its establishment in 1992, the SPC has grown to include over 100 member companies in Canada, the U.S., and internationally. The Centre is lead by a Board of Directors consisting of representatives from the local software industry and currently employs eight full-time staff and several contractors.

Membership

The SPC provides technical services and training to over 5000 software professionals within British Columbia. Those members located outside of the province receive discounts on products, on-site training and other technical services.

Members receive the SPC Update, a quarterly newsletter that provides details on upcoming events within the SPC; current industry issues; free monthly seminars featuring industry experts; and information on software engineering trends throughout the world. All member companies are listed on the web site at SPC and links are provided to members' web sites. Account managers are assigned to each member company and provide on-site and telephone support.

Services include software process assessments for small- and medium-sized organizations, as well as consulting that facilitates productivity and quality improvement. SPC tools also aid in the improvement of productivity and better control of the development process. The family of tools includes development documentation templates, which fully satisfy requirements for CMM Levels 2 and 3; ISO 9001-complaint templates; a software metrics tool; and a self-assessment tool.

Course Acquisition

The Centre's main focus is to supply practical assistance to software developers. A library of 24 modular software engineering courses offers specialized training for companies wanting a selection of courses to suit their current and future needs. Module courses cover Process Improvement, Project Management, Quality Assurance and Testing, Configuration Management, Requirements Specification and Analysis, ISO 9000, etc. The SPC also

presents tutorials, featuring international and local industry experts and focusing on technology-specific issues and practices. The SPC presents approximately 10 tutorials per year.

The newest course offered by SPC is the Personal Software Process (PSP). This course is a unique adaptation of the original format proposed by Watts Humphrey.

The SPC also organizes the Annual Software Practitioner's Conference (ASPC). This two-day conference includes tutorials from world-class speakers (e.g., in 1996 Timothy Lister, Judy Bamberger, and James Bach) and presentations on technical and managerial software engineering experiences from industry representatives.

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Software Quality Institute

The Software Quality Institute (SQI) is a multidisciplinary partnership between The University of Texas at Austin (UT-Austin) and the software and information systems organizations in Texas. Its mission is to inform and educate software producers and software users at the local, state, and national levels about issues vital to the production and application of high-quality software. SQI draws upon the wealth of research and expertise available at UT-Austin as well as from a large pool of outstanding talent from industry and government. SQI is a unit within the College of Engineering at UT-Austin.

Organization

SQI is guided by an advisory group of 28 representatives from industry and government who ensure that SQI activities meet industry needs, including program development and curriculum selection. Subcommittees oversee other SQI activities: publication of Software Quality Matters, a quarterly newsletter; Austin Software Executives' Group (ASEG) which brings key officers of small companies together to discuss business issues; the Austin Software Process Improvement Network (A-SPIN) which sponsors monthly meetings for developers and manager; SQI certificate programs on software project management and human interface design and development; the annual SQI Symposium and other special conferences.

SQI is a resource recovery program that receives funding from registration fees. Training is offered through public programs, courses that are taught on-site, and conferences. Programs currently underway include a 14-month Software Project Management Certificate Program, one- to three-day seminars, and the SQI Symposium on Software Reliability Engineering (April 1, 1997). A new certificate program will begin in the Spring of 1997 entitled "Human Interface Design and Development."

Membership

Not applicable

Course Acquisition

SQI programs are offered to professionals on a non-credit basis and topics are selected according to assessments. Proposals are solicited from potential instructors. Subject areas include software project management, risk management, in-process inspections, testing, human-computer interfaces, process, configuration management, and related topics.

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Software Technology Centre

The Software Technology Centre (STC) is an industry-led, strategic alliance with post-secondary educational institutions and the Saskatchewan and Canadian governments. Established in December 1993, the STC is a not-for-profit corporation whose mission is to assist the software community to be globally competitive, with the goal of stimulating the development of a strong private sector. To fulfill this mission and to meet members' and stakeholders' needs, the STC offers services in professional development, information collection and dissemination, strategic development, and software quality improvement. STC services complement, and do not compete, with industry.

The STC goal is to become a provincially recognized information technology centre with international linkages. It acts as a catalyst to assist members and stakeholders in global competitiveness; to deliver quality services to meet customers' evolving needs; to advocate the value of information technology; and to transfer world-class, state-of-the-art information technology knowledge, including software engineering principles and practices, to other economic sectors.

The STC provides:

- executive seminars, for example, on the implementation of process improvement
- software management programs, with a focus on process improvement and modern methods of defining and managing software development projects
- emerging technology programs
- network communications programs

Organization

The STC is led by a board of directors that is chaired and controlled by industry. Educational institutions and governments have seats on the board. Some notable STC founding members are Information Systems Management (ISM) Corporation (a subsidiary of IBM), CDSL Canada, Saskatchewan Telecommunications, and SED Systems. They are joined by about 30 other organizations, many of whom are local small-to-medium sized information technology firms. In addition to these individual member organizations, two other major associations have joined the STC: the Software Development Association of Saskatchewan, which has over 50 small firms as members; and the two Canadian Information Processing Society chapters in Saskatchewan, consisting of over 300 information technology practitioners. The STC has a strong educational base; the University of Regina and the University of Saskatchewan are full members.

The STC has formed a number of Canadian and international strategic alliances which contribute significantly to its ability to serve the needs of its members.

- The Software Process Improvement and Capability Determination (SPICE) Program, of which the STC is a member, is under the auspices of the International Standards Organization. With participants from about 20 countries, SPICE focuses on making software process improvement methods more widely used. The STC will coordinate the SPICE trials in the Canadian Prairie region.

- The European Software Institute (ESI), with which the STC has a formal cooperation agreement, provides the STC with the means to learn from major software engineering programs in the European Union. The ESI, located in Bilbao, Spain, is the major software engineering centre of the European Union.

- The Information Technology Association of Canada (ITAC), of which the STC is a regional affiliate, is the major national information technology association in Canada. The STC is the only member of the ITAC board of directors representing the Canadian Prairie region.

The centre consists of a small professional staff, which is routinely supplemented by contracted, private sector, and educational institution staff.

Membership

Annual membership fees entitle members to directly influence STC strategy, to receive discounts on services, and to benefit from synergy with other members. Members are always given priority access to services. Close, ongoing dialogue with members and clients is a key element in STC operations. These exchanges help the STC define its current and planned service offerings and ensure that the STC continually meets the emerging needs of the software and information technology community.

Course Acquisition

STC professional development programs emphasize solutions to the unique needs of two major organizational groups: MIS in-house organizations in both the private and the public sector and small-to-medium enterprises who are primarily software developers and system providers. The STC chooses its courses using the guidance of an advisory committee drawn from the software community. Key programs to be offered in 1996 include courses on executive-level awareness, software engineering, object-oriented methodologies, databases, and client-server networks. The STC is committed to the effective development and use of distance training technologies and methodologies.

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The University of British Columbia Certificate in Software Engineering

Introduced in September 1995, the Certificate in Software Engineering Program at The University of British Columbia (UBC) is designed to serve the professional development needs of information systems and software professionals in British Columbia and beyond. The program was developed with the input of local and provincial industry and includes partnerships in curriculum development and teaching expertise.

Organization

The growing need for professional development in the software engineering field led to the development of a proposal in September 1994 for a Certificate in Software Engineering. Consequently, Continuing Studies at UBC founded an advisory committee with representatives from relevant academic units and industry representatives.

- Centre for Integrated Computer Systems Research (UBC)
- Continuing Studies (UBC)
- Continuing and Distance Education for Engineering and Architecture (UBC)
- Department of Computer Science (UBC)
- Department of Electrical Engineering (UBC)
- Hughes Aircraft of Canada Ltd.
- Newnes Machines Limited
- Software Productivity Centre

With the guidance of the advisory committee, a needs and demand assessment was conducted, including interviews with local industry representatives, the distribution of surveys to prospective students, and research into existing programs and curricula. The majority of courses for the program are new offerings, but some current offerings of the Software Productivity Centre have also been incorporated into the program. The program is administered by UBC Continuing Studies.

Membership

The Certificate in Software Engineering Program is offered in a format compatible with the needs of local industry and will eventually serve the needs of companies located outside the Vancouver area. The program is also open to individuals who are currently employed in the software industry as well as those who may be seeking a change of career. Applicants to the

program who do not have prior knowledge in programming, formal mathematical methods, and computer systems are required to complete prerequisite courses.

Course Acquisition

The program requires a minimum of 102 hours from the following core courses:

- An Introduction to Software Engineering (6 hours)
- The Software Engineering Process (18 hours)
- Requirements Analysis and Specification (18 hours)
- Software Architecture and Iterative Development Process (12 hours)
- System/Software Testing (12 hours)
- Software Project Management (12 hours)
- Software Engineering Team Project (24 hours)

The program requires a minimum of 48 hours from the following elective courses:

- Software Quality Assurance (12 hours)
- Software Configuration Management (6 hours)
- Computer-Human Interface Design and Implementation (12 hours)
- Object-Oriented Methods (12 hours)
- Information Engineering and Database Systems (12 hours)
- Comparative Programming Languages (9 hours)
- Real-Time Systems (6 hours)
- Advanced Topics (6 hours)

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University of California, Santa Cruz

The University of California, Santa Cruz (UCSC) is located within close proximity to Silicon Valley, one of the world's foremost centers of the computer industry. A growing local computer industry, centered in Santa Cruz and Scotts Valley, provide further opportunities for our students. The Department of Computer Engineering at UCSC and the local computer industry recognize a need to provide effective graduate education in the area of software engineering. Local industry provides the "real world" problems and university faculty weave discussion of these problems into the graduate software engineering curriculum. Whenever possible, graduate student researchers, under the supervision of university faculty, are funded by industry to continue the work started in their courses.

Organization

Computer Engineering is an academic department offering both undergraduate and graduate degree programs. We hire local software engineering experts as lecturers in our program to bring industrial perspective to our software engineering curriculum. In addition to teaching for us, these lecturers serve as liaisons between UCSC and the local computer industry. One example of this collaboration is that local software companies have supported graduate students to extend projects that were started in the graduate software engineering courses.

Membership

Each year, industry projects are sought for our software engineering courses. Sponsors are also solicited for the graduates of the class. Previous sponsors include IBM, Santa Teresa Laboratory, and the Santa Cruz Operation, Inc.

Course Acquisition

Students can take software engineering courses by enrolling through UCSC Extension or as matriculated graduate students of UCSC.

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University of Maryland University College

The University of Maryland University College (UMUC) Graduate School of Management & Technology, College Park, Md., in partnership with Computer Data Systems, Inc. (CDSI), Rockville, Md., offers a Capability Maturity Model (CMM) Level 2 Software Process Management training course. This one-week course introduces software managers, software technical team leaders, and members of Software Engineering Process Groups to the CMM Level 2 software processes they need to apply to their software development and maintenance projects to improve their projects' maturity. UMUC awards participants four continuing education units (CEUs) upon course completion.

Organization

The partnership began in 1994 when CDSI contracted with UMUC for training course evaluation and certification services of an internal CMM Level 2 training program at CDSI. In 1996, UMUC and CDSI signed a memorandum of understanding to market and deliver Capability Maturity Model (CMM) Level 2 Software Process Management training in the state of Maryland, the mid-Atlantic region, and nationwide.

The partnership is administered by a Joint Administrative Group (JAG) with representatives from UMUC and CDSI. The JAG develops operating procedures, resolves issues, and acts as the change control board for the program. Each partner has specific roles. UMUC is responsible for marketing and promotional activities, program logistics and facilities, student registration services, CEU certification, and assistance to CDSI in program design and review, instructor assignment, and course evaluation. CDSI is responsible for providing instructors and all instructional materials. In addition, UMUC and CDSI jointly provide telephone assistance to all students who complete the training course for 30 days after course completion.

Membership

The UMUC Graduate School of Management and Technology provides short courses, certificate programs, and degree programs to working professionals in business, industry, and government to address the real challenges that managers face in today's globally competitive business environment. There are seven degree programs at the Master's level, including a Master of Science in Computer Systems Management, with a specialty track in Software Development Management, and a Master of Software Engineering (jointly with the University of Maryland/College Park).

CDSI, a publicly owned company founded in 1968, serves government, defense, and commercial customers with broad-based professional and technical services, including software development, software maintenance, and systems integration services. CDSI initiated its CMM-based Software Process Improvement Program in 1993 and has developed

and delivered the CMM Level 2 Software Process Management training course to 400 CDSI software managers and customer staff nationwide.

Individuals and/or their organizations fund their enrollment in the CMM Level 2 Software Process Management training course offered by UMUC and CDSI.

Course Acquisition

Training is conducted at the University of Maryland Conference Center, College Park, Md., and can also be provided on-site. CDSI provides the course materials, which include a software project case study, workshop exercises, and CMM Level 2 process templates. The training course consists of seven modules:

1. Overview of Software Process Improvement
2. Requirements Management
3. Software Project Planning
4. Software Project Tracking and Oversight
5. Software Quality Assurance
6. Software Configuration Management
7. Software Subcontract Management

The training approach is practical. All instructors are software engineering practitioners with experience in managing software development, maintenance, and integration projects on multiple platforms. Instructors share their experience in implementing CMM Level 2 key process areas in real world settings. Throughout the week, instructors facilitate team workshops to help students apply process management skills immediately. Students leave training with a package of CMM Level 2 process templates that they can tailor to their organization.

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The University of Southern California Center for Software Engineering

The University of Southern California (USC) Center for Software Engineering (CSE) was formed to develop more mature software engineering organizations to meet the demand for complex software systems of the future. Its bottom-line objective is to improve the long-range state of software engineering practice by catalyzing a new generation of software engineering courseware and delivery capabilities. Its 10-year strategy for achieving this objective involves a combination of sustained programs in software engineering education, research, and technology transition (Prospectus for the USC CSE affiliates Program, December 1992)

Organization

The USC CSE takes a multifaceted approach to improving the state of software engineering practice. It performs necessary gap-filling research in such areas as knowledge-based software engineering, environments, processes, architectures, and economics. In the fall of 1993, it initiated a master of science (MS) in computer science with a software engineering specialization. It has plans to develop textbooks, videos, computer models, games, tools, exercises, and role-model artifacts for training the next generation of software engineers. The USC CSE has an affiliates program with an active affiliates Steering Committee. The CSE director is part of the USC Computer Science Department; the center principals include USC professors in electrical engineering and business, and professors at the USC Information Sciences Institute.

Membership

Industry and government affiliates are a key aspect of the CSE. Through payment of an annual membership fee, affiliates acquire a seat on the affiliates Steering Committee. Center personnel provide an annual one-day visit to the affiliate organization, involving a professor and an agenda of the affiliate's choice. Affiliates participate in focused workshops, executive software seminars, an annual software engineering conference, and monthly software process improvement network (SPIN) meetings in collaboration with University of California Irvine. Affiliates receive prototype tools for experimentation, technical reports, and exploratory videos and courseware. There are currently 29 affiliate organizations.

Course Acquisition

While the center does not produce courses specifically for affiliates, member organizations benefit from annual one-day USC professor lectures and visits to the affiliate's organization. Periodic focused workshops provide the opportunity for technical interchange among professors, researchers, and practitioners. Most of the software engineering MS courses are

offered on a regional interactive television network; some of the courses are also offered nationally by the National Technological University.

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University of South Florida

The University of South Florida Information Systems and Decision Sciences (ISDS) Department and members of its industry advisory board have recognized the critical need for skilled software engineers in the Tampa Bay area. In response, the ISDS Department has expanded its curriculum offerings to include sequences of advanced courses on information systems development, database systems, and telecommunications at both the undergraduate and graduate degree levels. These courses are designed to present state-of-the-art theories, practices, and tools for the application of information technology to real problems in business and industry. Based on industry demand, the ISDS Department will offer a master of science (MS) degree in information systems beginning in fall 1996. This degree program will be offered on the Tampa campus with plans to expand to a distance learning environment in the future. An initiative is underway at the University of South Florida to develop a program of research and education on Cleanroom software engineering methods. Cleanroom is a theory-based, team-oriented process for on-schedule development and certification of ultra-high reliability software systems with improved productivity. The Cleanroom methods are emphasized in the ISDS curriculum. An important goal is to provide an effective technology transfer program for local industry via process consultation, tailored training, and demonstration projects.

Organization

The Institute for Information Systems Management (IISM) was established as a partnership between business, industry, government, and higher education in the Tampa Bay area. Its mission is to establish a major center for research, education, and professional networking in order to help technical organizations succeed in the fast-moving information age. The institute presents numerous seminars, workshops, and discussion sessions on important issues in the information systems field. Applied research is funded on topics of interest to its corporate affiliates. The ISSM provides a vital link between the business/industrial community and the ISDS program at the University of South Florida.

Membership

IISM members include the following firms.

- Arthur Andersen
- Andersen Consulting
- Barnett Technologies
- Citicorp
- Florida Power

- Great Western
- GTE Data Services
- Price Waterhouse
- Salomon Brothers
- Time Warner Customer Service
- Tropicana
- United Services Automobile Association (USAA)

Course Acquisition

Academic courses are offered at the University of South Florida on its main campus in Tampa and on its satellite campuses in St. Petersburg, Sarasota, and Lakeland. Degrees in management information systems are offered at the BS, MS, MBA, and PhD levels. Many students are full-time employees from area corporations who are enrolled in part-time educational programs. The ISDS Department also offers professional development courses on technical topics, such as UNIX system programming, Web publishing with JAVA, client-server computing, and Cleanroom software engineering. Tailored industrial training and professional consultation is offered at sponsor sites.

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The University of Texas at Austin

The Option II Master of Software Engineering in Software Engineering at The University of Texas at Austin is a two-calendar-year program that is offered as a specially scheduled option by the Department of Electrical and Computer Engineering in the College of Engineering at The University of Texas at Austin. Introduced in January 1996, the program is designed to allow practicing professionals the opportunity to obtain an advanced degree while maintaining full-time employment.

Organization

A survey of software executives who sit on the Departmental Visiting Committee of the Department of Electrical and Computer Engineering at The University of Texas at Austin was conducted to determine curriculum content and format.

The program is organized around four basic formats: two intensive software engineering seminars that meet for one week each year immediately preceding the start of the academic year; eight software engineering courses that meet once monthly (all day Friday and Saturday), with two courses a semester for four semesters; two summer courses that involve independent research projects; and the writing of a master's report. Candidates for this program should hold a BS degree in Electrical Engineering, Computer Engineering, Computer Science, or the equivalent.

Membership

Not applicable

Course Acquisition

The goal of the curriculum is to teach material on software engineering, with an emphasis on the design and analysis of software systems and on the management of software projects. The University of Texas at Austin requires at least 33 credit hours for a Master's degree with a report.

The curriculum includes:

- Analysis and Architectures of Software Systems: Programming
- Fundamentals for Software Engineers
- Domain Specific Software Architectures
- Advanced Topics I on Software Engineering
- Verification and Validation of Software
- Large Software/Hardware Communication Systems

- Programming Languages and Applications
- Methodologies for Hardware//Software Codesign
- Advanced Topics II on Software Engineering
- Systems Engineering Program Management and Evaluation
- Distributed Software Systems
- Master's Report

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This directory describes collaborative efforts to promote software engineering education among businesses and universities in the United States and Canada. The groups vary in their maturity and the services they provide. The reader can use this directory to find collaborations that match their needs and are located within their geographic area.

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